WHAT IS CLAIMED IS:

1. A combustion control system for a spark ignition internal combustion engine, the system being configured to:

detect engine operating conditions;

predict, based on the detected engine operating conditions, autoignition timing of an end gas and an amount of heat released due to autoignition of the end gas; and

control combustion to establish such a relationship between the autoignition timing and the amount of heat released due to the autoignition as to give a knock intensity not higher than a specified intensity limit.

2. A combustion control system according to Claim 1, wherein the knock intensity is calculated such that the knock intensity increases as the amount of heat released due to the autoignition is increased and as the autoignition timing is advanced.

3. A combustion control system according to Claim 2, wherein the knock intensity is calculated such that the knock intensity increases with engine speed.

4. A combustion control system according to Claim 1, wherein the specified intensity limit corresponds to a trace knock level.

5. A combustion control system according to Claim 1, wherein the combustion is controlled by adjusting ignition timing.

6. A combustion control system according to Claim 1, wherein the autoignition timing and the amount of heat released due to the autoignition are predicted by estimating an ignition delay of the end gas.

7. A combustion control system according to Claim 1, wherein the

occurrence of the autoignition is predicted by integrating the inverse of an ignition delay of the end gas to estimate the autoignition timing and the amount of heat released due to the autoignition.

8. A combustion control system according to Claim 1, wherein the occurrence of the autoignition is predicted by an elementary reaction model to estimate the autoignition timing and the amount of heat released due to the autoignition.

9. A combustion control system for a spark-ignition internal combustion engine, the system being configured to:

detect engine operating conditions;

predict, based on the detected engine operating conditions, an autoignition timing of an end gas and an amount of heat released due to autoignition of the end gas;

calculate a knock intensity from the autoignition timing and the amount of heat released due to the autoignition; and

control combustion in the engine in such a manner that the knock intensity is lower than or equal to a specified intensity limit.

10. A combustion control system according to Claim 9, wherein the knock intensity is calculated such that the knock intensity increases as the amount of heat released due to the autoignition is increased and as the autoignition timing is advanced.

11. A combustion control system according to Claim 10, wherein the knock intensity is calculated such that the knock intensity increases with engine speed.

12. A combustion control system according to Claim 9, wherein the specified intensity limit corresponds to a trace knock level.

13. A combustion control system according to Claim 9, wherein the combustion is controlled by adjusting ignition timing.

14. A combustion control system according to Claim 9, wherein the autoignition timing and the amount of heat released due to the autoignition are predicted by estimating an ignition delay of the end gas.

15. A combustion control system according to Claim 9, wherein the occurrence of the autoignition is predicted by integrating the inverse of an ignition delay of the end gas to estimate the autoignition timing and the amount of heat released due to the autoignition timing.

16. A combustion control system according to Claim 9, wherein the occurrence of the autoignition is predicted by an elementary reaction model to estimate the autoignition timing and the amount of heat released due to the autoignition.

17. A combustion control method for a spark-ignition internal combustion engine, comprising:

detecting engine operating conditions;

predicting, based on the detected engine operating conditions, autoignition timing of an end gas and an amount of heat released due to autoignition of the end gas; and

controlling combustion to establish such a relationship between the autoignition timing and the amount of heat released due to the autoignition as to give a knock intensity not higher than a specified intensity limit.

18. A combustion control method according to Claim 19, further comprising:

computing an engine torque while calculating the knock intensity; and

determining trace knock ignition timing and MBT ignition timing based on the knock intensity and the engine torque,

wherein said controlling includes setting spark ignition timing to either one of the MBT ignition timing and the trace knock ignition timing located on a retard side.

19. A combustion control method according to Claim 19, wherein the knock intensity is calculated such that the knock intensity increases as the amount of heat released due to the autoignition is increased, as the autoignition timing is advanced and as engine speed is increased.

20. A combustion control method for a spark-ignition internal combustion engine, comprising:

detecting engine operating conditions;

predicting, based on the detected engine operating conditions, autoignition timing of an end gas and an amount of heat released due to autoignition of the end gas;

calculating a knock intensity from the autoignition timing and the amount of heat released due to the autoignition; and

controlling combustion in the engine in such a manner that the knock intensity is lower than or equal to a specified intensity limit.

21. A combustion control method according to Claim 20, further comprising:

computing an engine torque while calculating the knock intensity; and

determining trace knock ignition timing and MBT ignition timing based on the knock intensity and the engine torque,

wherein said controlling includes setting spark ignition timing to either one of the trace knock ignition timing and the MBT ignition timing located on a retard side.

22. A combustion control method according to Claim 20, wherein the knock intensity is calculated such that the knock intensity increases as the amount of heat released due to the autoignition is increased, as the autoignition timing is

advanced and as engine speed is increased.